Videotape

Video Design and Modification by Curt Roseman

There is a growing trend among video hardware distributors to offer modification packages allowing the operator greater flexibility in the deployment of portable equipment. Many retailers now offer the following options: manual override for target voltage and audio gain, conversion of battery meter to VU meter, microphone/line input selector, and additional co-ax video inputs and outputs. While these features offer convenience value, there is no appreciable improvement of the recorded video signal.

This may be of little consequence to producers of in-house programming. But those seeking a union of flexibility and signal integrity—necessary for upgrading to broadcast standards—require more specialized services. Such was the concern of Susan and Allan Raymond in their production "The Police Tapes," recently aired on NET. Realizing the limits to which their equipment would be pushed, they sought the technical expertise of WNET'S experimental lab—and one man in particular, George Brown.

During the last few years George has worn many hats in the field ranging from shop maintenance to independent research and design in digital video signal processing. Among the happy users of his equipment are the Rhode Island School of Design, Woody Vasulka, and many experimental video artists.

Having met George about six years ago, we had had little contact until his name crawled across the credits of the Raymonds' production: Technical Consultant—George Brown. Excited by the performance level of what appeared to be production-line equipment, I decided to get in touch.

The location conditions facing the Raymonds are generally considered anathema for any broadcast situation: low light, high contrast, multiple unscripted voices, and various chaotic and violent environments such as dark alleys, automobiles, and police stations.

At the pickup end of the Raymonds' AVC 3400 camera George installed a newvicon tube—a component he considers superior to the factory-installed vidicon. In addition to the greater sensitivity of its silicon diode target, it can handle a greater brightness range and is thus less prone to the lag and "puddling" characteristics of vidicon and tivicon tubes (the latter having high infra-red sensitivity).

He then set upon the AVC 3400's
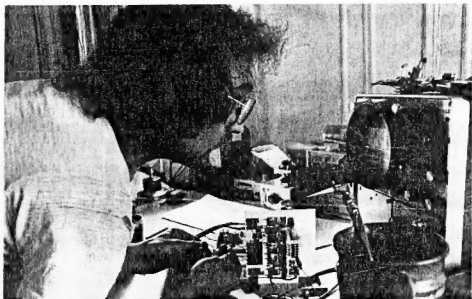
George Brown ponders a voltage drop.
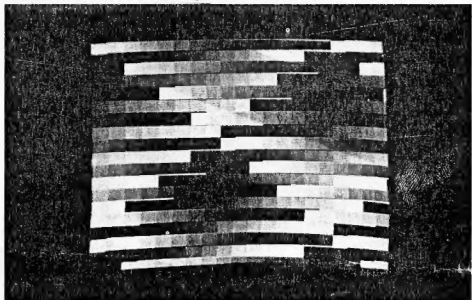
Pattern of 256 pieces resulting from 8-bit input from digital generator.

processing circuits. Since the stock camera has no provisions for adjusting the parameters of the video and sync signals, George replaced the existing components with those of more "standard value." In this manner the relatively wide (8 microseconds) sync pulse could be brought down to the standard of 5 microseconds. Sync level and clamp pulse widths were similarly improved. Thus the signals would receive the maximum amount of control with the least amount of noise—necessary conditions since the signal would be subject to various post-production and duping processes on the way to final broadcast. (A more recent improvement George plans for this camera

will be a gamma converter which will balance out tone scale discrepancies between the newvicon tube and the display monitor.)

George doesn't care to fool around with audio systems. But since it was part of the total package, he installed a manual gain control, VU meter, and a headphone amplifier to enhance the low output of the earphone line. A soon-to-come addition he is planning to make to this system is a pocket-sized 3-input microphone preamp-mixer.

Some of you may be intrigued enough already to seek out this man. Unfortunately, he neither solicits nor accepts offers for his services on a large scale.

George has seen a lot of independent video of documentary and artistic persuasions but very little that he admires, respects, or even tolerates. In his estimation, he rarely sees a tape where production values measure up to the engineering standards of the hardware.

And there is one video format which he considers so far below broadcast standard that it is almost totally useless—½" color. Given the sheer bulk of information necessary for a good color signal, George feels ½" tape is not yet sophisticated enough to handle a broad enough sample of the electromagnetic spectrum, or band pass. In addition, tape-to-head speed must increase if the change of magnetic orientation (on the tape) is to keep up with the rate of the video signal. But just as 1" color quality has become indistinguishable from quad, he has faith that ½" color will eventually be on a par with the present ¾" format.

Until that day, producers using the facilities of WNET's experimental lab have the option of transferring Super-8 color original to a suitable tape format via a modified Kodak VPX. Editing and other post-production functions can then be accomplished with all the ease for which video systems are well-known. Lamenting certain flaws in the VPX's frame handling, George still considers the flying-spot design concept sound enough that the color signal deserves upgrading. By by-passing the built-in color encoder and using the house encoder (Cohu), a color dupe onto ½" tape results in color quality approximating ¾" cassette.

While modifications keep George's hands busy, it is design and innovation which form the substance of his personal interests. Cameras, VTRs, and monitors are merely necessary evils for that entity which is paramount in his work: the video signal itself. The manipulation of the signal through the design and interfacing of video processors (SEG's) seems to be forever in the vanguard of contemporary video. If you can imagine what an image should look like on the monitor, then George can build a circuit to process it. Sometimes these descriptions are elusive: When a video artist wants an image to "fold in on itself" you can almost see a cartoon-style question mark forming above George's head.

Since the specific variables of each processor are countless, I'm merely going to outline some of the generic functions: Since any shape within a raster can be addressed via conventional camera or digital pulse inputs, images of increasing complexity can be built and mixed by increasing the number of these inputs. The matrix may be further processed and sequenced along through the input of electronic functions such as wipes, fades, and key levels. These electronic functions may be controlled by voltage, digital pulse, or simple time-delay function. Furthermore, the resulting output can be looped back into the matrix for additional processing with another set of inputs. The addition of a priority coder allows the user to set values on the keying channels giving the illusion that one key is in front of or behind another. Other feasible options might include oscillation control and interface circuitry for the input of audio synthesizers.

Even without a lot of fancy options, a "simple" six-input mixer-switcher with five key channels is easily capable of over ten thousand variables. Since the human mind is not yet accustomed to dealing with such a vocabulary in real-time, assembly fashion, the processor can be designed with computer interface to facilitate pre-programming. Like George says, "It's not like playing the banjo." That's why he places great emphasis on control panel design. Rather than address the processor with an arbitrary array of switches and dials, push-button matrix inputs are functionally grouped, clearly labeled, and noise-free. Indicator lights accompanying input functions give the operator a "feel" for the relative complexity of the processed image. Adding the option of memory allows for retrieval through simple word commands when interfaced with a typewriter keyboard.

George Brown's latest brainchild—still in progress—is a soft, digital colorizer. While most colorizers convert black and white video signals into garishly keyed-in, blocky contours, this processor will be capable of rendering a virtual infinity of changes along the hue scale with broader controls for saturation and brightness. Working with a digitally expanded grey scale, the resulting color will range from nearly natural to positively neurotic. It will interface with computer circuitry and utilize memory loop-through for matrix re-entry. Completion is scheduled for August with a budget estimated at $3500.

In producing a limited quantity of sophisticated hardware for an almost non-existent market, George seems to assume the archetypal roles of craftsman and alchemist. Working alone in his singularly unattractive Brooklyn studio, he has made contributions to the state of the art by closing the gap between vision and technology. The concrete benefits of this process of demystification will be increased access to the exponentially expanding matrix of information and tools —with plenty of time left over to play the banjo.